

REMARKS

Various independent claims in the application were rejected on the basis of Shibata U.S. Patent No. 6,117,388 or Ernst, et al., U.S. Patent No. 6,030,469 or the Campbell Publication submitted by Applicant. In response thereto, Applicant has amended the claims to more particularly point out and distinctly claim the subject matter of the invention. Replacement claims include amended independent claims 1, 59, 105, 106, 107, 108, 109, 110, 111 and new claim 123. The remaining claims depend from the noted independent claims.

The invention relates to a carbide strengthened alloy composition wherein nitrogen content is minimized. To accomplish the carbide strengthening feature of the alloy, at least about 1.7% by weight to about 5% by weight nickel is incorporated in the alloy along with the other constituents as set forth in the independent claims. The claims have thus been amended to set forth a lower limit of nickel of about 1.7% by weight based upon the specific teachings set forth in the specification. It is believed that this lower limit clearly differentiates the claims in combination from all the prior art references relied upon by the Examining Attorney.

The principal references include the Ernst reference. Ernst relies upon nitrogen to effect strengthening rather than carbon and carbide strengthening. Ernst develops a high temperature alloy which provides for formation of nitrides at high temperatures. In the present invention, nitrogen is controlled as a limited impurity and carbon is kept above about 0.1 weight percent. Nitrogen, for example, has an impact on the martensite start temperature (M_s) of an alloy. To utilize nitrogen in steels and enable a lower martensitic start temperature, one must compensate by lowering the content of other materials, such as nickel. The present invention, utilizing carbides, does not require such lowering of other components for a given strength level of the steel, and thus one can provide higher nickel content, *inter alia*, for better ductility and fracture

toughness. Whereas the alloys of the present invention achieve very high strength levels without the addition of nitrogen and the disadvantages associated therewith, Ernst does not teach how to achieve a carbide strengthened alloy of the composition set forth by Applicant.

Other references likewise are not anticipatory nor do they render obvious the claimed invention. Shibata features a nickel content which is significantly lower than the subject matter of the claims as presently amended. The upper limit of the nickel content in the Shibata reference according to text at column 3, lines 18-24 is 1.5% by weight. Applicant, in contrast, utilizes nickel in the amount at least about 1.7% by weight. As a result of Applicant's combination of constituents, enhanced strength, ductility, fracture toughness and corrosion resistance are achieved relative to the Shibata disclosed material, for example.

With respect to the Campbell reference, it is noted that it does not disclose the use of nickel. Nickel with respect to the present invention results in providing increased toughness for the alloy steel in a M_2C carbide hardened steel. Applicant has thus provided a formulation and methodology whereby nickel is incorporated into the alloy in an amount that significantly increases the toughness of the steel. Combining Campbell with other references is clearly not suggested, let alone is not obvious to try, and certainly it is not obvious that such a combination can provide carbide strengthening at higher limits of materials such as nickel.

Claim 1, for example, provides a carbide strengthened alloy having a minimum of at least about 1.7% by weight nickel wherein the carbides have the formula M_2C . Claim 59 has similar limitations. Claims 105 – 111 set forth various species compositions with such limitations. Claim 123 is a new claim setting forth a carbide strengthened alloy which includes M_2C carbides and nickel in an amount of at least 1.7% by weight.


In view of the foregoing, therefore, it is believed that the claims in their amended condition are allowable. Reconsideration thereof and passage to allowance is earnestly solicited.

Respectfully submitted,

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